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SERVICE MANUAL
7000 Series
T71 Indicators

T71P

T71XW

SERVICE MANUAL

7000 Series T71 Indicators:

T71P & T71XW

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1.1 INTRODUCTION

This service manual contains the information needed to perform routine maintenance and service on the Ohaus T71 Indicators. The contents of this manual are contained in five chapters:

Chapter 1 Getting Started – Contains information regarding service facilities, tools and test equipment, specifications, hardware setup or disassembly, operating the Indicator, scale setup and calibration, and configuring the Indicator's communication and Legal-for-Trade menus.

Chapter 2 Troubleshooting – Contains a diagnosis/diagnostics chart and error code table.

Chapter 3 Maintenance Procedures – Contains preventive maintenance procedures and disassembly, repair and replacement procedures.

Chapter 4 Testing – Contains an operational test, segment display test, performance tests and adjustments.

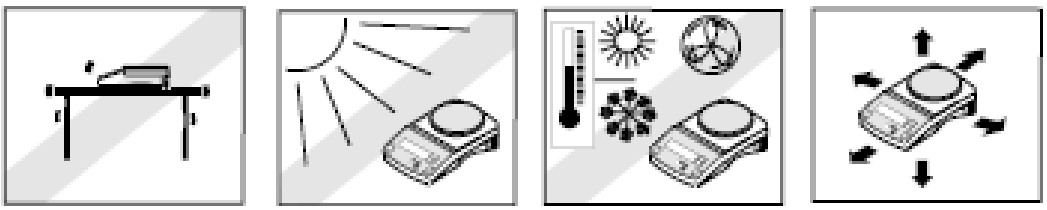
Chapter 5 Drawings and Parts Lists – Contains exploded views of T71 Indicators, identifying all serviceable components.

Before servicing the indicator, you should be familiar with the Instruction Manual which is packed with every indicator.

1.2 SERVICE FACILITIES

To service an indicator, the service area should meet the following requirements:

- Must be protected from electrostatic discharge.
- Should be temperature controlled and meet the indicator specifications for temperature environmental requirements. See specifications for temperature range.
- Must be free of vibrations such as fork lift trucks close by, large motors, etc.
- Must be free of air currents or drafts from air conditioning/heating ducts, openwindows, people walking by, fans, etc.
- Area must be clean and air must not contain excessive dust particles.
- Work surface must be stable and level.
- Work surface must not be exposed to direct sunlight or radiating heat sources.



1.3 TOOLS AND TEST EQUIPMENT REQUIRED

In order to properly service the Indicator, certain special tools and test items are required in addition to standard electronic tool kits. These items are listed as follows:

1.3.1 Special Tools and Test Equipment List

1. Ohaus Scale Base.
2. Load Cell Simulator optional.
3. Computer with RS232 Interface.
4. RS232 Interface cable.
5. Data Printer for use with RS232 communications.
6. ESD work station or mat.

1.3.2 Standard Tools and Test Equipment List

1. Standard Electronics Tool Kit
2. Digital Voltmeter (DVM), with clip-on probes. Input impedance of at least 10 megohms in the 1 Volt dc position.
3. Soldering Iron, solder and flux remover.

1.4 Top and Bottom Housing

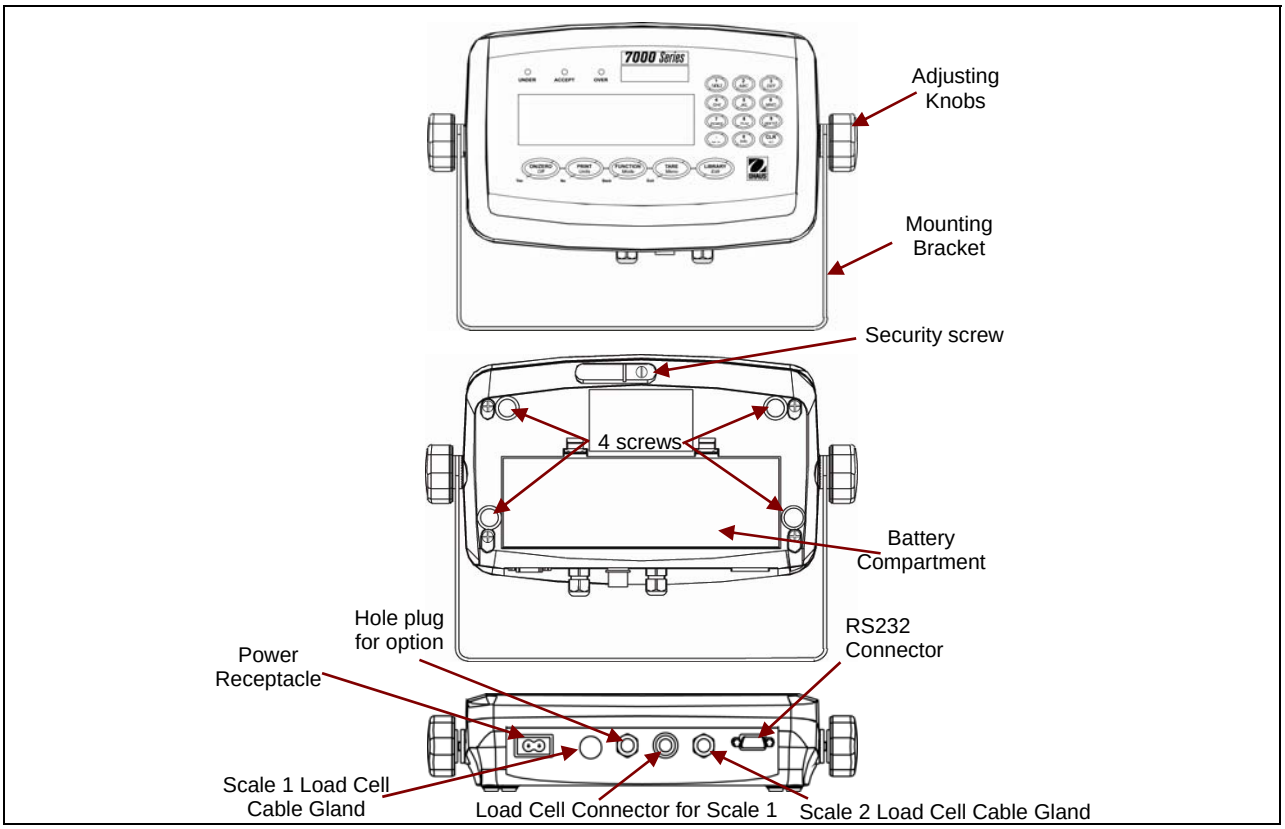


Figure 1-1. Top and Bottom Housing, and Rear Panel, T71P.

1.4 Top and Bottom Housing

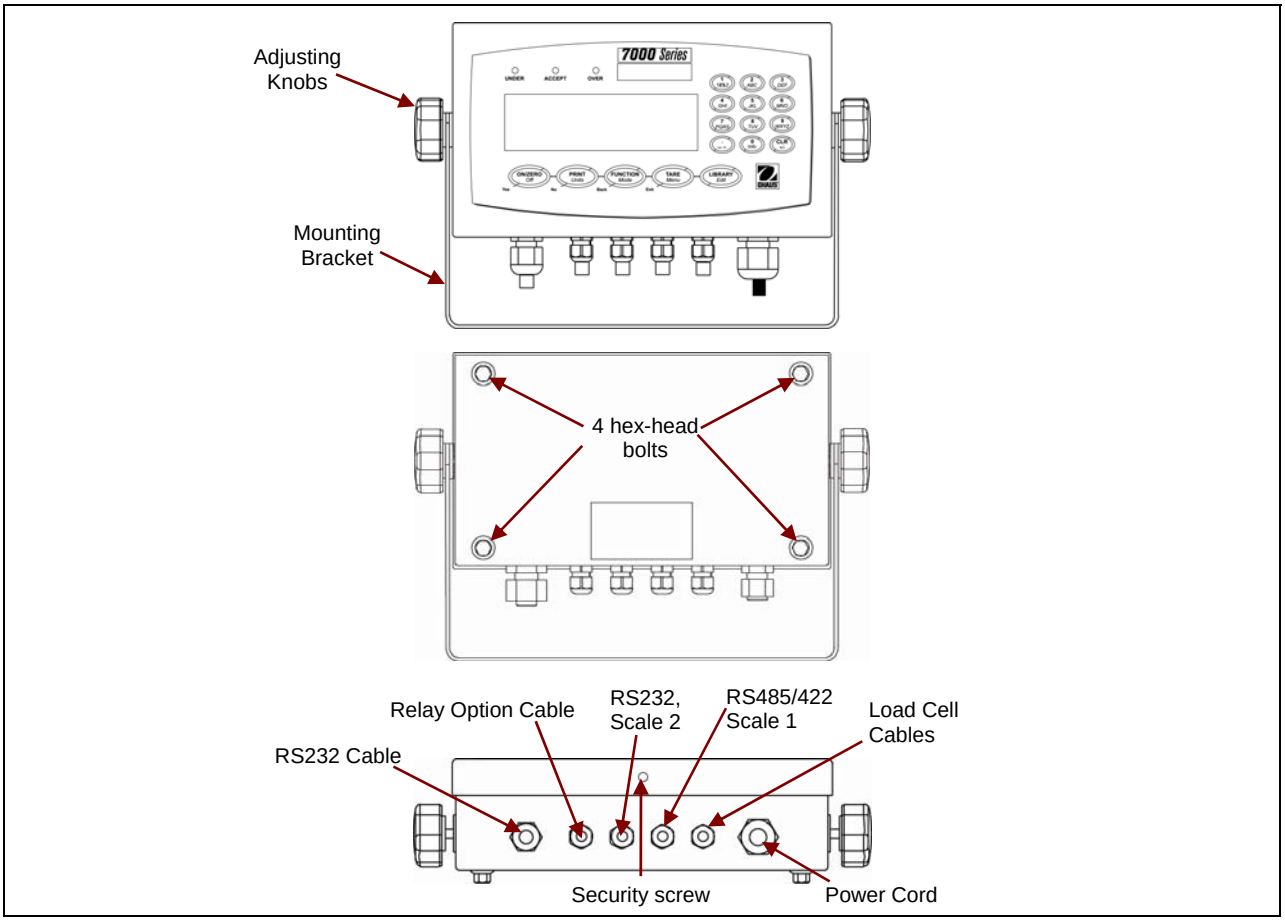


Figure 1-2. Top and Bottom Housing, and Rear Panel, T71XW.

1.5 SPECIFICATIONS

TABLE 1-1. SPECIFICATIONS

Model	**T71P**	**T71XW**
Maximum Displayed Resolution	1:50,000	
Maximum Approved Resolution	1:10,000	
Maximum Counting Resolution	1:500,000	
Weighing Units	Kg, lb, g, oz, lb:oz, tonnes, custom	
Functions	Static Weighing, Dynamic Weighing, Parts Counting, Checkweighing, Percent Weighing, Vehicle Weighing	
Display	25 mm / 1 in High, 2-line LCD	
Over/Accept/Under Indicators	Red, Green, Yellow LED	
Backlight	White LED	
Ingress Protection	---	IP66
Load Cell Excitation Voltage	5V DC	
Load Cell Drive	Up to 8 x 350 ohm load cells	
Load Cell Input Sensitivity	Up to 3mV/V	
Stabilization Time	Within 2 seconds	
Auto-Zero Tracking	Off, 0.5, 1 or 3 divisions	
Zeroing Range	2% or 100% of capacity	
Span Calibration	1 kg or 1 lb to 100% capacity	
Interfaces	RS232, External Input; optional Com2*	
Overall Dimensions (W x D x H) (in/mm)	10.2 x 2.7 x 6.6 / 260 x 71 x 168	10.3 x 3.0 x 5.8 / 262 x 76 x 149
Net Weight (lb/kg)	3.3 / 1.5	7.7 / 3.5
Shipping Weight (lb/kg)	5 / 2.3	9.5 / 4.3
Operating Temperature Range	–10°C to 40°C / /14°F to 104°F	
Main Power	100-240 VAC / 50-60 Hz, Internal Universal Power Supply	
Battery Power	6 C-type (LR14) Batteries Rechargeable battery pack (option)	Rechargeable battery pack (option)

*Can be either **RS232 or RS422/485.**

1.6 HARDWARE SETUP OR DISASSEMBLY

Both the T71P and T71XW connect to a scale base through a Load Cell Cable that connects to the Indicator's Main Printed Circuit Board (PCB).

CAUTION:
ELECTRICAL SHOCK HAZARD. REMOVE ALL POWER CONNECTIONS TO THE INDICATOR BEFORE SERVICING OR MAKING INTERNAL CONNECTIONS.

The process of opening the Housing varies slightly for each model:

T71P:

1. Remove the four Phillips head screws from the rear housing.
2. Open the housing; disconnect the ribbon cable from the top of the PCB.

T71XW:

1. Remove the four hex head screws from the rear housing.
2. Open the housing by carefully pulling the top of the front housing forward.

Figure 1-2 shows T71's Main PCB, with connectors, jumpers, terminals and switches indicated.

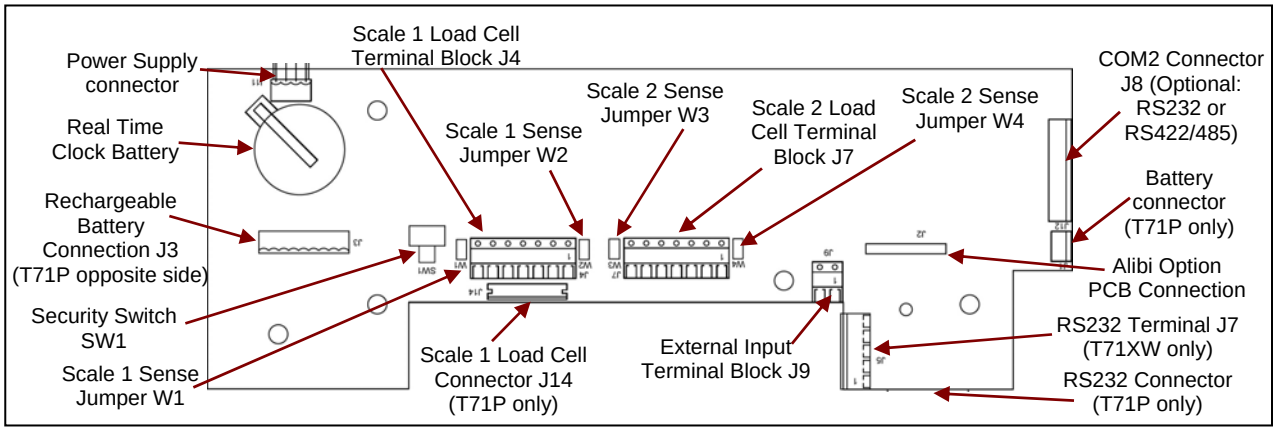

Power Supply connector
Real Time Clock Battery
Rechargeable Battery Connection J3 (T71P opposite side)
Security Switch SW1
Scale 1 Sense Jumper W1
Scale 1 Load Cell Terminal Block J4
Scale 1 Sense Jumper W2
Scale 2 Sense Jumper W3
Scale 2 Load Cell Terminal Block J7
Scale 2 Sense Jumper W4
Scale 1 Load Cell Connector J14 (T71P only)
External Input Terminal Block J9
COM2 Connector J8 (Optional: RS232 or RS422/485)
Battery connector (T71P only)
Alibi Option PCB Connection
RS232 Terminal J7 (T71XW only)
RS232 Connector (T71P only)

Figure 1-3. Printed Circuit Board (PCB), T71 Indicator.

1.6.1 Connecting the Scale Base's Load Cell

The T71P has a circular connector jack on its Bottom Housing. The white plastic six-wire plug connects to the Scale 1 Load Cell Connector J14. (See Figure 1-3.)

Attach a base *without* a circular connector to one of the Load Cell Terminal Blocks on the Main PCB. Pass the load cell cable through a Cable Gland (see Figure 1-1) and attach it to Terminal Block J4 or Terminal Block J7. (See Figure 1-4.) Tighten the Cable Gland to secure the cable and maintain a tight seal. Jumper connections must be shorted or opened as follows:

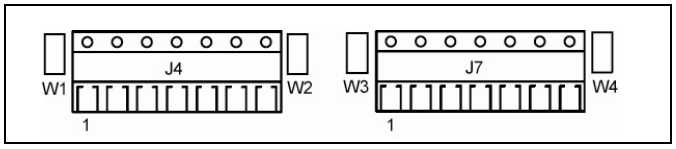


Figure 1-4. Load Cell Terminal Blocks J4 (Scale 1) and J7 (Scale 2).

1.6.2 Jumper Connections

When a 4-wire load cell is attached to terminal block J4, jumpers W1 and W2 must be shorted.

When a 6-wire load cell is attached to terminal block J4, jumpers W1 and W2 must be open.

When a 4-wire load cell is attached to terminal block J7, jumpers W3 and W4 must be shorted.

When a 6-wire load cell is attached to terminal block J7, jumpers W3 and W4 must be removed.

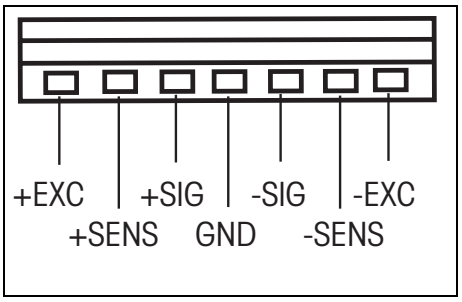


Figure 1-5. Load Cell wiring.

Pin	Connection
1	+Excitation
2	+Sense
3	+Signal
4	GND
5	–Signal
6	–Sense
7	–Excitation

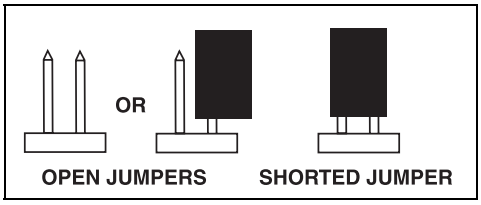


Figure 1-6. Open/shorted jumpers.

1.6.3 RS232 Interface

The T71P has a built-in RS232 Interface: a standard 9-pin D-style female connector on the back of the T71P Housing. In addition, each model (T71P and T71XW), has an optional COM2 connector, which can be either RS232 or RS422/485. The optional interface is available separately, with its own instructional manual for installation and configuration.

The RS232 pin configuration for the T71P is illustrated in Figure 1-7, below.

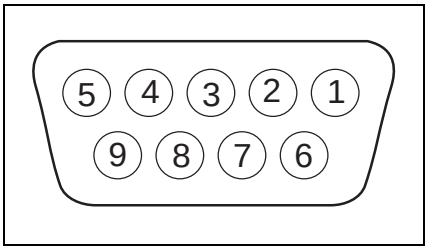


Figure 1-7. RS232 Pins.

Pin	Connection
1	N/C
2	TXD
3	RXD
4	N/C
5	GND
6	N/C
7	CTS
8	RTS
9	N/C

For software setup of the RS232 Interface, through the Indicator's menu, see Section 1.9.

All other aspects of hardware configuration and setup are described in the Instruction Manual.

1.7 OPERATION

This section contains information on the basic operation of the Indicator. An exploded view drawing is included in Chapter 5 which identifies all components of the indicator. The descriptions in this manual refer to the names of the components identified in the exploded view drawing with the numbered callout.

1.7.1 Power Supply

Both models have an Internal Universal Power Supply, 100-240 VAC / 50-60 Hz. For the T71XW, connect the power cord to a properly grounded electrical outlet. For the T71P, connect the AC power cord to the power receptacle on the rear of the Bottom Housing, then connect the AC plug to an electrical outlet.

The T71P indicator can also be operated on six alkaline batteries (not supplied) when AC power is not available. It will automatically switch to battery operation if there is power failure or the power cord is removed. The indicator can operate for up to 80 hours on battery power.

During battery operation, the battery charge symbol indicates the battery status. The indicator will automatically turn-off when the batteries are fully discharged.

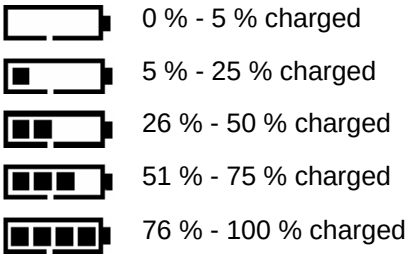


Figure 1-8. Battery charge symbol.

1.7.2 OVERVIEW OF THE CONTROLS

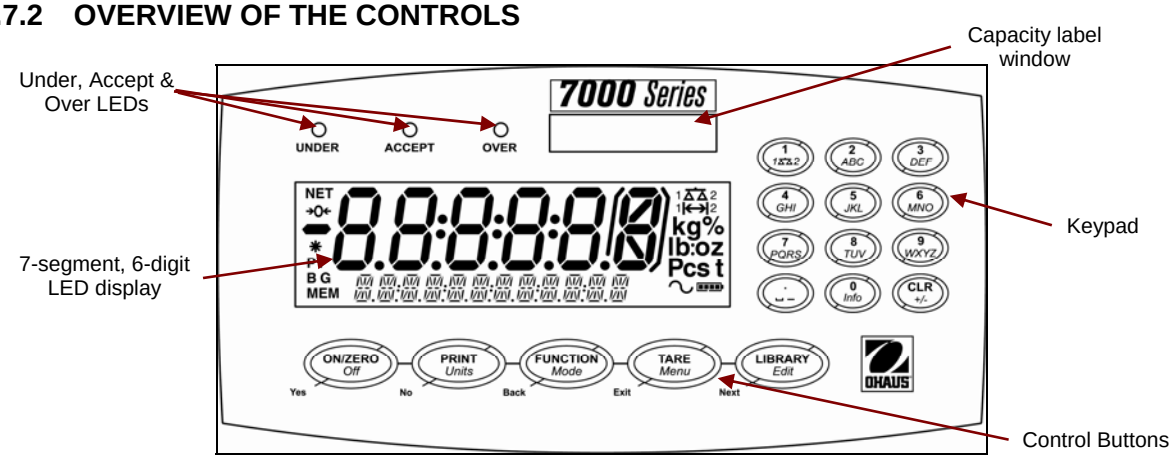


Figure 1-9. T71 Display.

1.7.3 OVERVIEW OF THE DISPLAY INDICATORS

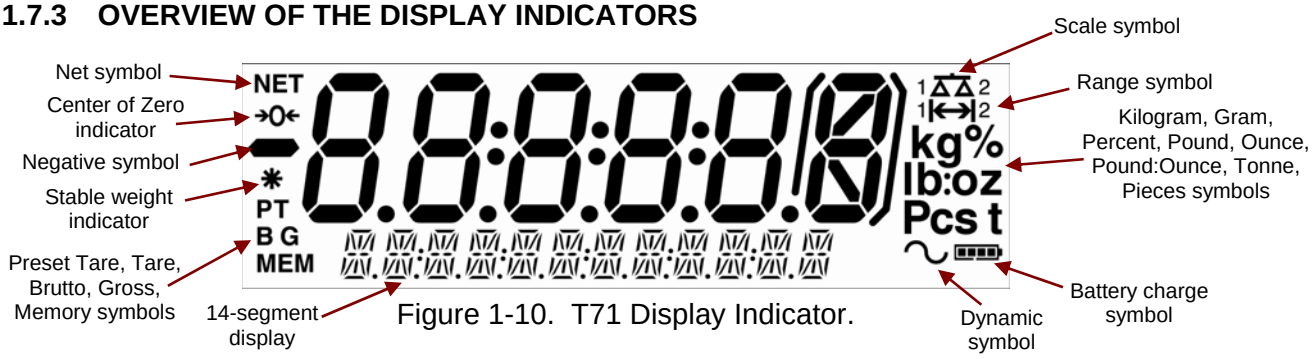


Figure 1-10. T71 Display Indicator.

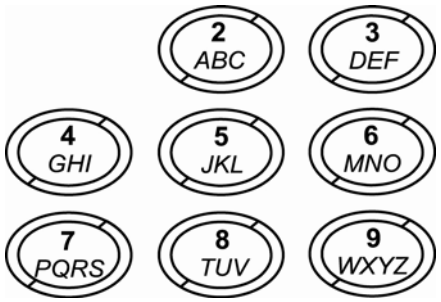
1.7.4 OVERVIEW OF THE CONTROL FUNCTIONS

TABLE 1-2. FUNCTIONS OF DISPLAY CONTROLS

Button					
Primary Function (Short Press)	**ON/ZERO** Turns the Indicator on If Indicator is on, sets zero.	**PRINT** Sends the current value to the COM port if AUTOPRINT is set to Off.	**FUNCTION** Initiates an application mode. Temporarily displays the active mode's reference data.	**TARE** Performs a tare operation.	**LIBRARY** Display the library data.
Secondary Function (Long Press)	***Off*** Turns the Indicator off.	***Units*** Changes the weighing unit.	***Mode*** Allows changing the application mode. Press and hold allows scrolling through modes.	***Menu*** Enter the User menu.	***Edit*** Enable editing the current library record.
Menu Function (Short Press)	***Yes*** Accepts the current menu or setting.	**No** Advances to the next menu or menu item. Rejects the current setting on the display and advances to the next available setting. Increments the value.	**Back** Moves back to previous menu item. Decrements the value.	**Exit** Exits the User menu. Aborts a calibration in progress.	
Library Function (Short Press)	***Yes*** Accepts the current setting.	**No** Advances to the next library or setting. Increments the displayed value.	**Back** Moves back to previous library or setting. Decrements the displayed value.	**Exit** Exits the library.	

1.7.4 OVERVIEW OF THE CONTROL FUNCTIONS

TABLE 1-3. FUNCTIONS OF DISPLAY KEYPAD

Button					
Primary Function (Short Press)	**1** Enter 1 on the display.	**2ABC through 9WXYZ** Enter alphanumeric values on the display using the multi-tap text entry method.	**. _ -** Enter decimal point, space or dash on the display.	**0** Enter 0 on the display.	**CLR** Clear the last character from the display
Secondary Function (Long Press)	***1s2*** Change display between Scale 1 and Scale 2.			***Info*** Show the Accumulation statistics on the display.	**+/-** Change the polarity of the displayed value.

1.7.5 Menu Setup

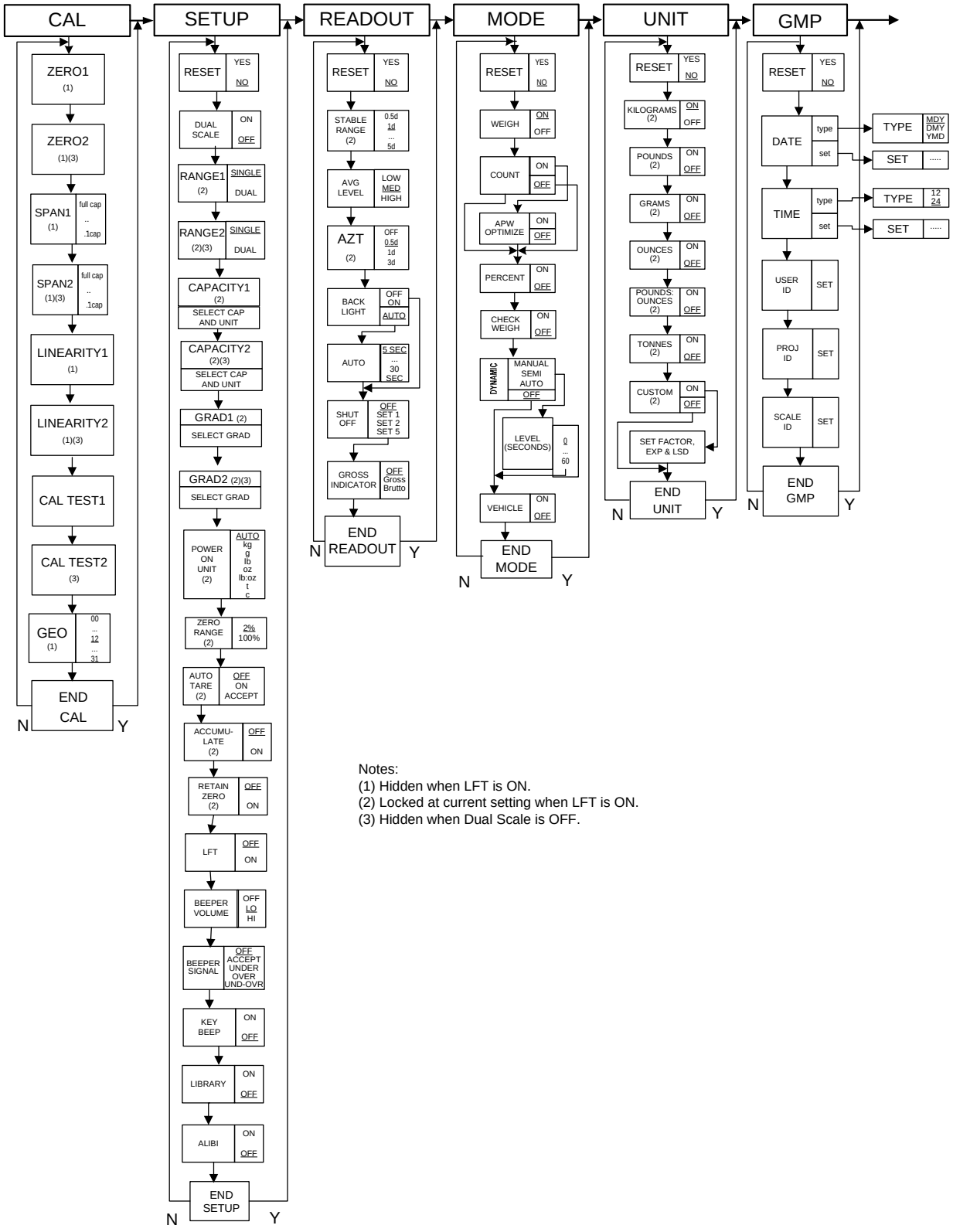
To enter the Menu Mode, press and hold the **TARE/*Menu*** button until MENU appears on the display. The first upper level menu appears on the display.

Use **Yes**, **No**, **Back**, and **Exit** to navigate in Menu Mode:

- **Yes** Allows entry into the displayed menu.
  Accepts the displayed setting and advances to the next menu item.
- **No** Skips by the displayed menu.
  Rejects the displayed setting or menu item and advances to the next available item.
- **Back** Moves backwards through the upper and middle level menus.
  Backs out of a list of selectable items to the previous middle level menu.
- **Exit** Exits from menu directly to the active weighing mode.

1.7.5 Menu Setup

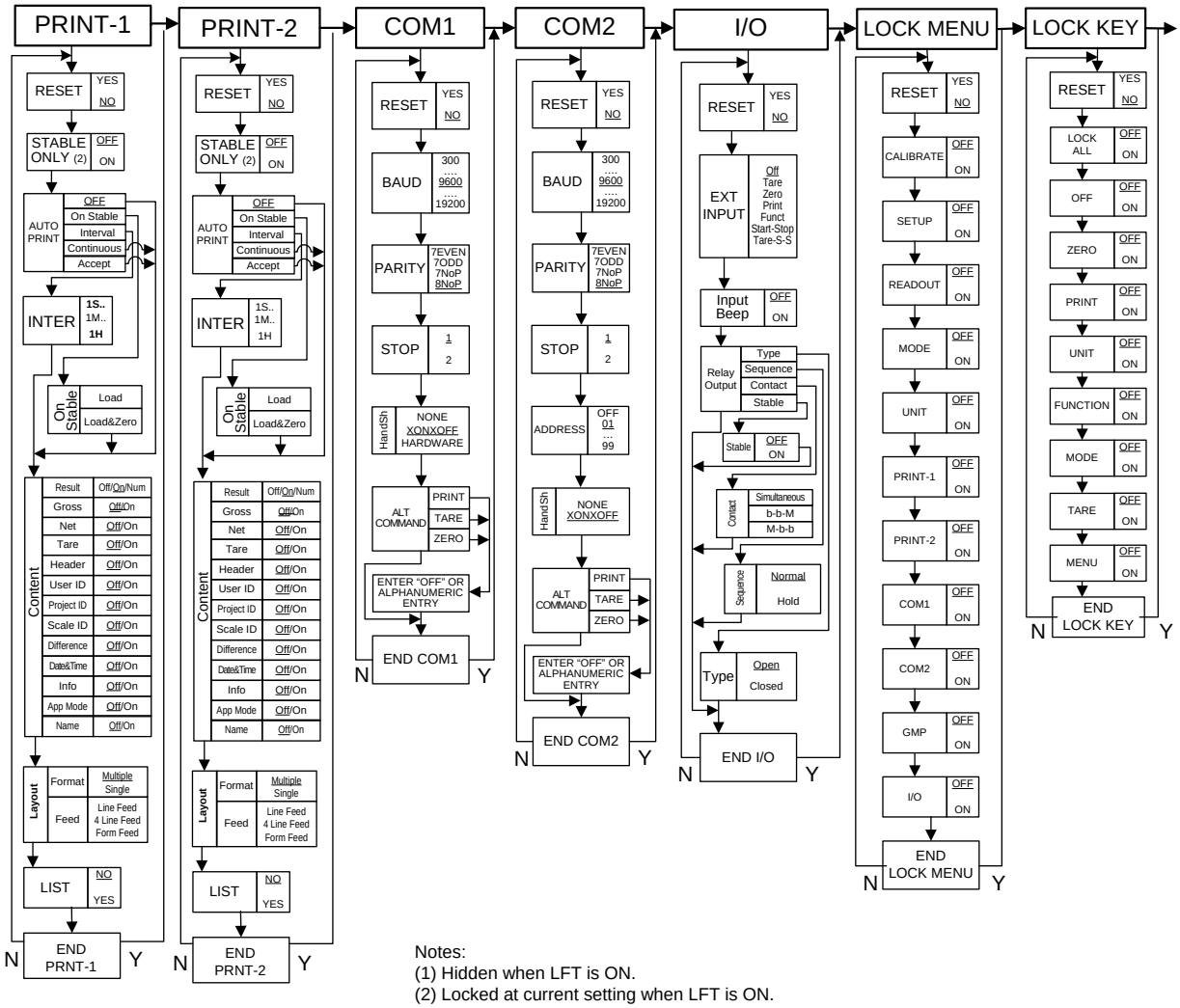
Table 1-4. T71 MENU STRUCTURE (Part 1).



Notes:
(1) Hidden when LFT is ON.
(2) Locked at current setting when LFT is ON.
(3) Hidden when Dual Scale is OFF.

1.7.5 Menu Setup

Table 1-4. T71 MENU STRUCTURE (Part 2).



Notes:
(1) Hidden when LFT is ON.
(2) Locked at current setting when LFT is ON.
(3) Hidden when Dual Scale is OFF.

1.7.6 Language Menu Setup

The T71 menus are available in English, Spanish, German, French and Italian. To change the menu language, press and hold **TARE/***Menu* until MENU appears. When the button is released, the Legal For Trade status is displayed, followed by the first menu.

To navigate the menus, press **No** to move to the next menu or **Back** to move to the previous one. Press **Yes** to enter the displayed menu. Press **Exit** to immediately leave a menu and return to weighing mode.

The map below shows the steps to enter the Language menu and choose Español.

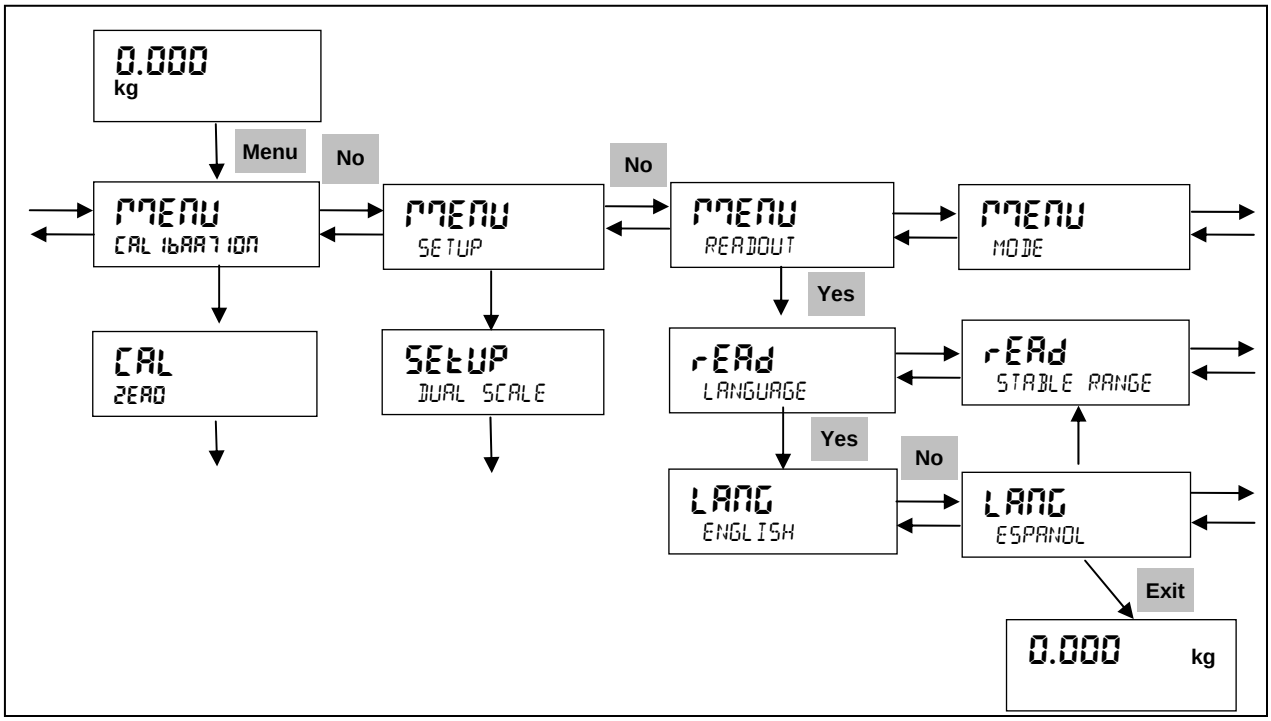


Figure 1-11. Changing the menu language.

1.8 CALIBRATION

Four calibration processes are available: Zero, Span, 3-point Linearity and 5-point Linearity Calibration. In addition, a Calibration Test and Geographical Adjustment Factor setting are accessible from the CAL menu.

Preliminary Steps:

1. Be sure appropriate calibration masses are available before beginning calibration.
2. Be sure the scale base is level and stable during the entire calibration process.
3. If LFT is set to On, calibration is unavailable.
   To set LFT to OFF, see Section 1.10, page 1-19.
   Note: To use the LFT mode again after turning it off, it is necessary to have the Indicator locked and sealed by local Weights and Measures authorities.
4. If the Calibration Menu is locked in the Menu Lock submenu, turn it back on:
   – Press and hold **TARE/*Menu*** until MENU *LFT OFF* appears briefly, followed by MENU *CALIBRATION.* Press **No** until MENU *MENU LOCK* appears. Press **Yes**.
   – L.MENU *RESET* appears. Press **No**. L.MENU *LOCK CAL* appears. Press **Yes**.
   – L.CAL *OFF* flashes. Press **Yes**. Then Press **Exit** to return to weighing mode.

   – Open the Indicator and put the Security Switch on the Main PCB in the OFF position.
5. Allow the Indicator to warm up for approximately five minutes after stabilizing to room temperature.
6. To abort calibration, press the **Exit** button anytime during the calibration process.

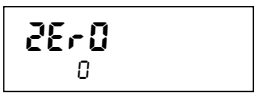
1.8.1 Zero Calibration

Zero calibration uses one calibration point. The zero calibration point is established with no weight on the scale. Use this calibration method to adjust for a different pre-load without affecting the span or linearity calibration.

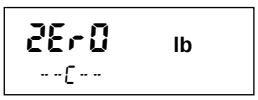
Press and hold **TARE/*Menu*** until LFT OFF flashes and CALIBRATION appears.
Press **Yes**. CAL *ZERO* appears. Press **Yes**.

Note: If DUAL SCALE is OFF, the ZERO, SPAN, 3PTLIN, 5PTLIN menu items are displayed. If DUAL SCALE is ON, the ZERO1, ZERO2, SPAN1, SPAN2, 3PTLIN1, 3PTLIN2, 5PTLIN1, 5PTLIN2 menu items are displayed.

With no load on the scale, press **Yes** to set the new zero point.



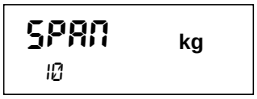
The display shows ZERO --*C*--, then ZERO *DONE* and returns to the current application mode.



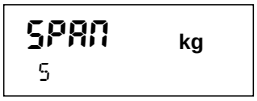
1.8.2 Span Calibration

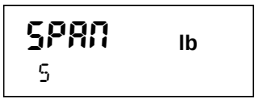
Use this calibration method to adjust the zero calibration point and span calibration point, without affecting the linearity calibration. Be sure there is no load on the scale.

Press and hold **TARE/***Menu* until LFT OFF flashes and CALIBRATION appears. Press **Yes**. CAL *ZERO* appears. Press **No**.
CAL *SPAN* appears. Press **Yes**. SPAN and the current unit of measure and Span calibration point flash.



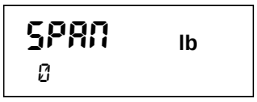
Note: To change the span calibration point, press **No** and enter the value using the keypad. Then press **Yes**.
To change the calibration unit of measure, press **No** to alternate between kg and lb.





Place the specified calibration weight on the scale and press **Yes**.
The display shows SPAN --*C*--, followed by SPAN *DONE*.

SPAN *0* appears. With no load on the scale, press **Yes**.

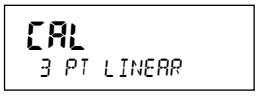


The display shows SPAN --*C*--, followed by SPAN *DONE,* and returns to the current application mode.

1.8.3 3-point Linearity Calibration

This calibration method uses three points. The full-calibration point is established with a weight on the scale. The mid-calibration point is established with a weight equal to half of the full calibration weight on the scale. The zero calibration point is established with no weight on the scale. The mid-calibration points cannot be altered by the user during the calibration procedure.

Press and hold **TARE/***Menu* until LFT OFF flashes and CALIBRATION appears. Press **Yes**. CAL *ZERO* appears. Press **No**.
CAL *SPAN* appears. Press **No**. 3 PT LINEAR appears.



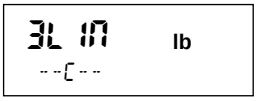
With no load on the scale, press **Yes**. The display shows the current full load calibration point and calibration unit of measure.

Note: To change the full load calibration point, press **No** and enter the desired value using the keypad. Then press **Yes**.
To change the calibration unit of measure, press **No** to alternate between kg and lb.

Place the specified full load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the 1/2 load calibration point.

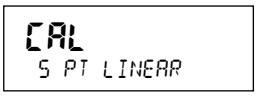
Place the specified 1/2 load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the zero calibration point.

With no load on the scale, press **Yes**. The display shows --*C*--, then *DONE*, and returns to the current application mode.



1.8.4 5-point Linearity Calibration

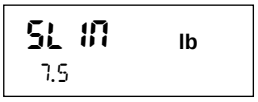
Use this calibration method to adjust the zero calibration point, 1/4, 1/2. 3/4 and full load calibration points. Go to the Calibration menu, and Press **No** until 5 PT LINEAR appears.



With no load on the scale, press **Yes**. The display shows the current full load calibration point and calibration unit of measure.

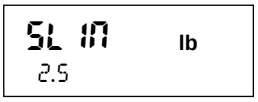
Note: To change the full load calibration point, press **No** and enter the desired value using the keypad. Then press **Yes**.
To change the calibration unit of measure, press **No** to alternate between kg and lb.

Place the specified full load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the 3/4 load calibration point.

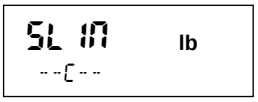


Place the specified 3/4 load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the 1/2 load calibration point.

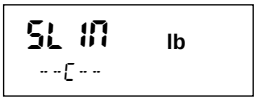
Place the specified 1/2 load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the 1/4 load calibration point.

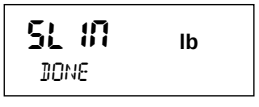


Place the specified 1/4 load calibration weight on the scale and press **Yes**. The display shows --*C*--, followed by the zero calibration point.

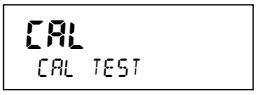


With no load on the scale, press **Yes**. The display shows --*C*--, then *DONE,* and returns to the current application mode.





1.8.5 Calibration Test

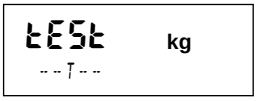


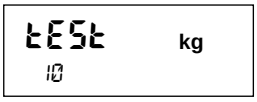
NOTE: Calibration Test is always available (even when LFT is set to ON).

Calibration test is used to compare a known calibration weight against the stored span calibration data. Go to the Calibration menu, and Press **No** until CAL *CAL TEST* appears.

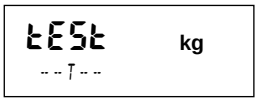
With no load on the scale, press **Yes**. The display shows the zero load calibration point.

With no load on the scale, press **Yes**. The display shows --*T*--, followed by the full load calibration point.

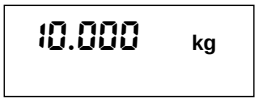




Place the specified full load calibration weight on the scale and press **Yes**. The display shows --*T*--, followed by difference between the calibration weight and the stored calibration data.



After five seconds, the display returns to the current application mode.



1.8.5 Geographical Adjustment Factor

The Geographical Adjustment Factor (GEO) is used to compensate for variations in gravity. To determine the GEO factor that corresponds to your location, see Appendix A.

Note: Changing the GEO Factor alters the calibration. The GEO value was set at the factory and should only be changed if the location of use varies from the default setting.

To adjust the GEO Factor, go to the Calibration menu, and Press **No** until CAL *GEO* appears. Press **Yes**. The default GEO setting appears. Press **No** to increment the number, or **Back** to decrement, until the desired number appears. Then press **Yes**.

Settings from 1 to 31 are available.

CAL *GEO* appears again. Press **No** to exit the **GEO** menu. Then press **Exit** to return to the current application mode.

1.9 RS232 INTERFACE CONNECTION

The T71 has a bi-directional RS232 interface for communication with printers and computers. When the Indicator is connected to a printer or Programmable Logic Controller (PLC), displayed data can be output various ways, depending on PRINT menu settings.

For hardware setup of the RS232 Interface, see Section 1.5.2, page 1-6.

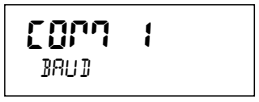
1.9.1 Setting Communications Parameters (COM1)

Note: Only the COM1 menu appears unless the COM2 interface is set up.

The T71 Indicator's default communication parameters are baud rate 9600 bits per second (bps), 8 databits, no parity, Handshake XON/XOFF, Address Off, Alt Command (for Print) Off, Alt Tare Off, and Alt Zero Off.

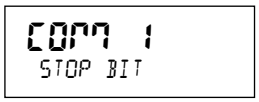
To change these settings use the COM1 menu, as follows:

1. Press and hold **TARE/***Menu* until LFT OFF flashes and CALIBRATION appears. Press **No** until **COM1** appears. Press **Yes. RESEt** appears. Press **No** (unless you want to restore the factory defaults).

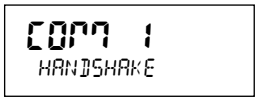


2. COM 1 *bAUd* appears. Press **Yes**.
3. The default Baud rate setting, **9600** bps, appears. To change the setting, press **No.** The menu cycles to the next setting each time you press No: first 9600, then 300, 600, 1200, 2400, 4800, and 9600 again. Press **Yes** when the desired setting appears. COM 1 *bAUd* appears again. Press **No**.

4. COM 1 *PAritY* appears. Press **Yes**. The default Parity setting, **8 NONE**, appears. To change the setting, press **No**. The menu cycles to the next setting each time you press **No**: first 7 Even, then 7 Odd, 7 None, and 8 None again. Press **Yes** to accept a setting. **PAritY** appears again. Press **No**.



5. COM 1 *StOP BIT* appears. Press **Yes**. The default Stop Bit setting, **1**, appears. To change the setting, press **No**. The menu toggles to the next setting each time you press No: first 1, then 2, then 1 again. Press **Yes** when the desired setting appears. COM 1 *StOP BIT* appears again. Press **No**.



6. COM 1 *HANdSHAKE* appears. Press **Yes**. The default setting, *NONE*, appears. To change the setting, press **No**. The menu toggles to the next setting each time you press No: first *XON-XOFF*, then *HARDWARE,* then *NONE* again. Press **Yes** to accept a setting. Then menu moves to the next item.

7. COM 1 *ALT COMMAND* appears. Press **Yes** to set a different command character for the P (Print), T (Tare) and Z (Zero) commands. Otherwise, press **No**. Then press **Yes** when COM 1 END COM1 appears.

At this point, if a second communication interface is present, the COM2 menu is available. Otherwise, press Exit to return to current application mode.

1.9.2 Interface Commands

The RS232 Interface enables a computer to be used to control some functions of the Indicator using the commands listed in Table 1-4.

TABLE 1-5. SERIAL INTERFACE COMMAND TABLE.

Command[1]	Function
ON	Turns the indicator on.
OFF	Turns the indicator off.
IP	Immediate Print of displayed weight (stable or unstable).
P[2]	Print stable displayed weight (according to stability setting).
CP	Continuous Print
SP	Print when stable.
xP	Interval Print x = Print Interval (1-3600 sec)
Z[2]	Same as pressing Zero button
T[2]	Same as pressing Tare button
xT	Download Tare value in grams (positive values only). Sending 0T clears tare (if allowed)
PU	Print current unit: g, kg, lb, oz, lb:oz
xU	Set scale to unit x: 1=g, 2=kg, 3=lb, 4=oz, 5=lb:oz
PV	Version: print name, software revision and LFT ON (if LFT is set ON).
H x “text”	Enter Header line , where x = line number 1 to 5, “text” = header text up to 24 alphanumeric characters
Esc R	Global reset (All menu settings are reset to the original factory defaults.)

Notes:

1. Commands sent to the Indicator must be terminated with a carriage return (CR) or carriage return-line feed (CRLF).
2. Alternate command characters may be defined by the user.
3. Data output by the Indicator is always terminated with a carriage return-line feed (CRLF).

1.9.3 Output Format

The Result Data is output in the following format.

TABLE 1-6. DEFAULT SERIAL OUTPUT FORMAT

Field:	Label[1]	Space[2]	Weight[3]	Space[2]	Unit[4]	Space[2]	Stability[5]	Space[2]	G/N[6]	Space	Term Characters
Length:	≤11	≤1	9	≤1	≤5	1	≤1	≤1	≤3	≤1	0 ??

Notes:

1. In certain cases, a Label field of up to 11 characters is included. –
2. Each field is followed by a single delimiting space (ASCII 32).
3. The Weight field is nine right-justified characters. If the value is negative, the "– " character is located at the immediate left of the most significant digit.
4. The Unit field contains the unit of measure abbreviation, up to five characters.
5. The Stability field contains the "?" character if the weight reading is not stable. The Stability field and the following Space field are omitted if the weight reading is stable.
6. The G/N field contains the net or gross indication. For net weights, the field contains "NET". For gross weights, the field contains nothing, "G" or "B", depending on the GROSS INDICATOR menu setting.
7. The Termination Characters field contains CRLF, Four CRLF or Form Feed (ASCII 12), depending on the LINE FEED menu setting.

For more information, see the Instruction Manual.

1.10 LEGAL FOR TRADE (LFT)

NOTE: When LFT is set to ON through the LFT sub-menu, and the Security Switch on the Main PCB is set to ON (see Figure 1-1, page 1-2), the following menu settings cannot be changed:

> Span Calibration, Linearity Calibration, Calibration Unit, GEO, LFT, Capacity, Graduation, Zero Range, Stable Range, AZT, Modes, and Units.

To enable editing of these menu settings, open the Indicator and put the Security Switch on the Main PCB in the OFF position. Then set the LFT menu item to OFF, as follows:

1. Press and hold **TARE/*Menu*** until MENU *LFT OFF* appears briefly, followed by MENU *CALIBRATION.* Press **No**.
2. **S.E.t.U.P** appears. Press **Yes**. Then press **No** until **LFt** appears. Press **Yes**.
3. ***OFF*** appears. Press **Yes**.
4. **LFt** appears again. Press **No**. Then press **Exit** to return to the current application mode.
5. It is now possible to use the abovementioned menus.

After the Security Switch has been turned off, before it can be used in a trade approved application, it must be inspected in accordance with local weights and measures regulations.

The weights and measures official may apply a wire or paper security seal as shown below.

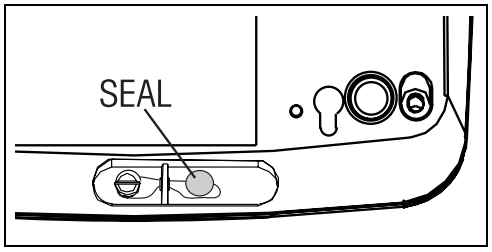


Figure 1-12. T71P Wire Seal.

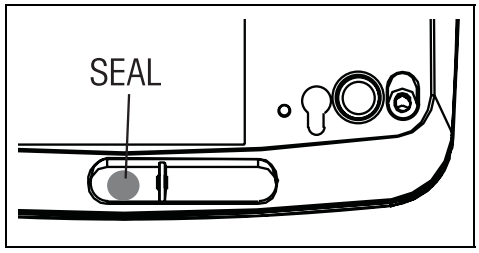


Figure 1-13. T71P Paper Seal.

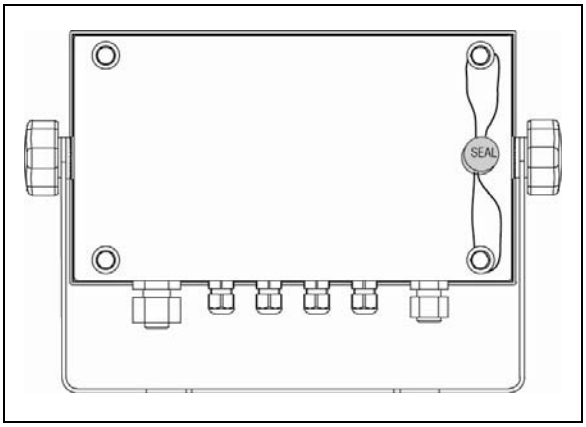


Figure 1-14. T71XW Wire Seal

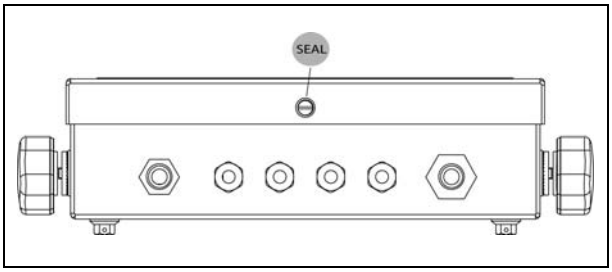


Figure 1-15. T71XW Paper Seal

2.1 INTRODUCTION

This section of the manual covers visual inspection of the Indicator, troubleshooting, and a Diagnostic Guide, Table 2-1. For setup and connection to either a known good base or simulator, see Chapter 1. Follow all directions step by step. Make certain that the work area is clean and use care when handling components of the Indicator.

2.2 VISUAL INSPECTION

Carefully remove the Indicator from its packing container and remove any packing material fastened to the unit. Note all items supplied with the unit such as AC power supply, cables, instruction manual, weights, etc. Keep a record of all items and note their condition.

1. Examine the Indicator for signs of abuse such as a cracked top cover or base, damage from liquids, cracks on corners, which may suggest the unit was dropped.

2. Open the Indicator by removing the four screws in the rear housing. Be careful not to stretch the cables that connect the main Printed Circuit Board (PCB) to the outlets (RS232 and Load Cell ports) and power supply.

3. Examine the top of the main PCB for cracks or signs of corrosion.

4. If it appears that corrosion may have affected the board and you want to examine the bottom of the PCB, remove the four screws holding it to the housing.

5. Carefully lift out the main PC board. If it is cracked or shows signs of corrosion, it requires replacement. See Chapter 3, Maintenance Procedures, for board replacement and testing. If the Indicator shows no sign of physical damage, continue with procedures.

See chart below for visual checking procedures.

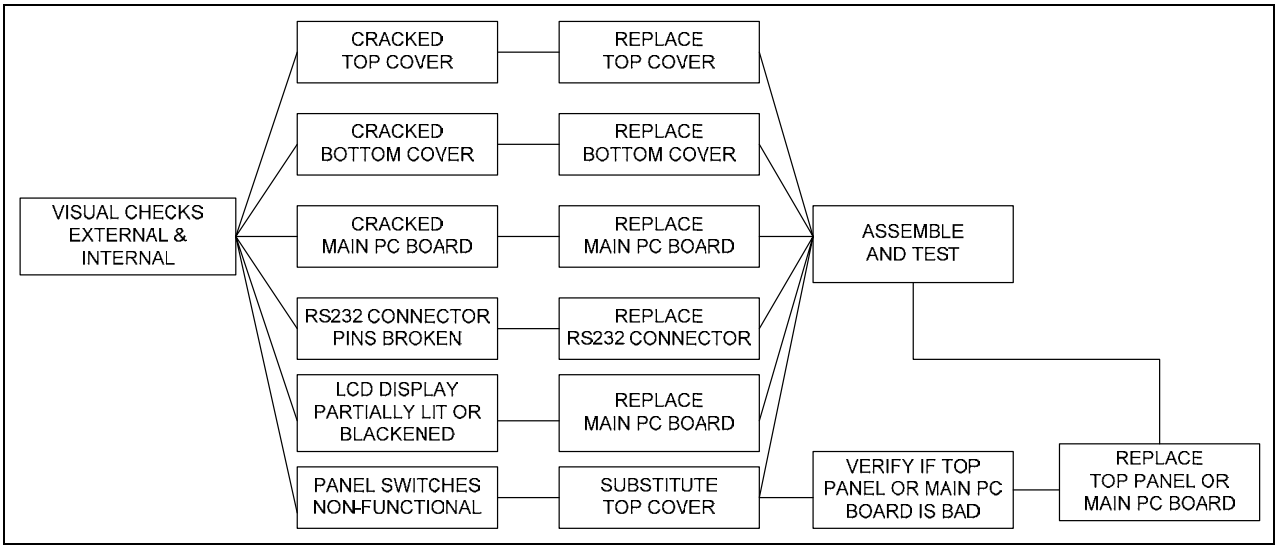

VISUAL CHECKS EXTERNAL & INTERNAL
CRACKED TOP COVER
REPLACE TOP COVER
CRACKED BOTTOM COVER
REPLACE BOTTOM COVER
CRACKED MAIN PC BOARD
REPLACE MAIN PC BOARD
RS232 CONNECTOR PINS BROKEN
REPLACE RS232 CONNECTOR
LCD DISPLAY PARTIALLY LIT OR BLACKENED
REPLACE MAIN PC BOARD
PANEL SWITCHES NON-FUNCTIONAL
SUBSTITUTE TOP COVER
ASSEMBLE AND TEST
VERIFY IF TOP PANEL OR MAIN PC BOARD IS BAD
REPLACE TOP PANEL OR MAIN PC BOARD

Figure 2-1. Visual Checking Procedures.

2.3 DIAGNOSTIC GUIDE

Table 2-1 is a Diagnostic Guide designed to help locate the problem area quickly and easily. The probable causes are listed with the most common cause first. If the first remedy does not fix the problem, proceed to the next remedy. Before attempting any repairs, read all chapters of this manual to be familiar with overall operation and all components.

2.2.1 Diagnosis

1. Isolate and identify the symptom
2. Refer to Table 2-1, Diagnostic Guide and locate the symptom.
3. Follow the suggested remedies in the order they appear.
4. Perform the indicated checks, or see the appropriate section of the manual.
5. Repair or replace the defective part.

NOTE:
If more than one symptom is observed, approach one area at a time, and remember that the symptoms may be interrelated.

If a problem arises that is not covered in this manual, contact Ohaus Corporation for further information.

2.2.1 Diagnosis

TABLE 2-1. DIAGNOSTIC GUIDE

Symptom	Possible Cause(s)	Remedy
Unit will not turn on	Power cord not plugged in or properly connected. Power outlet not supplying electricity. Battery discharged. Other failure.	Check power cord connections. Make sure power cord is plugged in properly into the power outlet. Check power source. **Replace disposable batteries or recharge NiMH Pack.** Check cable connections; replace PCB.
Battery symbol blank	Battery discharged.	Replace disposable batteries or recharge NiMH Pack.
Cannot zero the Scale, or will not zero when turned on	Load on Scale exceeds allowable limits. Load on Scale is not stable. Load Cell damage.	Remove load on Scale. Wait for load to become stable. Replace Load Cell.
Poor accuracy	Improper calibration Unstable environment	Perform calibration. Move scale to suitable location.
Unable to calibrate	Unstable environment Incorrect calibration mass Lock Calibration Menu set to On. LFT menu set to On. Main PCB failure	Move the scale to suitable location. Use correct calibration mass. Set Lock Calibration Menu to Off. Set LFT menu to Off. Replace Main PCB.
Cannot display weight in desired weighing unit	Unit not set to On.	Enable unit in the Units Menu.
Problems with Display (missing characters, partial display, erratic or unstable display)	Display PCB failure	Check Display PCB Cable. Replace Display PCB. Replace Main PCB.
Cannot change menu settings	Menu has been locked.	Set selected menu to Off in the Lock Menu. Lockout Switch on the circuit board may need to be set to the Off position. (See Figure 1-1.)
Does not retain correct time	Real time clock battery failure	Replace real time clock battery. (See Figure 1-3.)

Symptom	Possible Cause(s)	Remedy
Error 8.1	Weight reading exceeds Power On Zero limit.	Remove load from scale. Recalibrate scale.
Error 8.2	Weight reading below Power On Zero limit.	Add load to scale. Recalibrate scale.
Error 8.3	Weight reading exceeds Overload limit.	Reduce load on scale.
Error 8.4	Weight reading below Underload limit.	Add load to scale. Recalibrate scale.
Error 8.6	Weight value exceeds six digits.	Use more appropriate unit of measure. Reduce load on scale.
---------- displayed	Busy message. Displayed during tare setting, zero setting, printing	If this message persists, it usually indicates the reading is not stable. Correct the instability.
--NO—displayed	The action is not allowed.	Do not attempt this operation.

3.1 PREVENTIVE MAINTENANCE

Ohaus Indicators are precision instruments and should be carefully handled, stored in a clean, dry, dust-free area, and cleaned periodically. Follow these precautionary steps:

– When an Indicator has had chemicals or liquids spilled on it, all exterior surfaces should be cleaned as soon as possible with warm water on a damp cloth.

– Allow at least 10 minutes for the Indicator to stabilize after moving it from an area which is at a different temperature than the area where it is to be operated.

3.1.1 Preventive Maintenance Checklist

The Indicator should be inspected and checked regularly, as follows:

1. Unplug the AC Adapter before cleaning.

2. For the T71P, clean the outside using a cloth dampened with a mild detergent.

3. For the T71XW, use appropriate cleaning solutions for the stainless-steel Indicator housing and rinse with water. Dry thoroughly.

CAUTION

DO NOT USE CHEMICAL CLEANERS OR SOLVENTS OF ANY TYPE.
SOME CLEANERS ARE ABRASIVE AND MAY AFFECT THE SCALE'S FINISH.

4. Check the Power Cord for broken or damaged insulation.

5. Make a visual inspection for faulty connectors, wiring, and loose hardware.

3.2 REPLACEMENT OF MAJOR COMPONENTS

The decision to replace any component should only be made after thoroughly diagnosing the problem. If, after the replacement of any component, the Indicator is still non functional and no other information on the subject is available in the manual, contact Ohaus Corporation by visiting www.ohaus.com. In the United States call Ohaus Aftermarket toll free, 800-526-0659 between 8:00 a.m. and 4:00 p.m. EST.

3.2.1 Main Printed Circuit Board (PCB) Replacement

Repairs are not recommended on the Main PCB. Component parts of the Main PCB are not stocked by Ohaus. Replacement is recommended rather than repairing.

1. Unplug the Indicator from the AC power source.
2. Remove the four screws from the Bottom Housing.
3. Carefully separate the Top Housing and Bottom Housing – on the T71P, disconnect the Display PCB's ribbon cable from the top of the Main PCB.
4. Pull all cable connectors from their plugs on the Main PCB, including (on the T71XW), the Display PCB's ribbon cable from the Main PCB.
5. If cable-leads are connected to the Scale 2 Load Cell Connector J7 (see Figure 1-1), loosen the terminal block's set-screws and remove the leads.
6. On the T71P, remove the hex screws connecting the RS232 Interface port to the Bottom Housing, so the port will clear when the PCB is lifted out.
7. Remove the four screws from the PCB. (…and, on the T71XW, a fifth securing the grounding cable to the PCB on the lower left.)

CAUTION

When handling the PCB, grasp it by the edges only!
Do not touch the foil side. Static discharge may damage some components.

8. Lift out the PCB.
9. Carefully re-position the replacement PCB over the screw holes in the Top Cover. Re-insert and tighten the screws.
10. Reconnect the cables removed in Steps 4 and 5.
11. On the T71P, re-insert the hex screws connecting the RS232 Interface port to the Bottom Housing.
12. Close the Housing and re-insert the four screws.
13. Perform calibration procedures. (See Section 1.8.)
14. Perform testing procedures. (See Chapter 4.)

3.2.2 Display Printed Circuit Board (PCB) Replacement

Repairs are not recommended on the Display PCB. Component parts of the Display PCB are not stocked by Ohaus. Replacement is recommended rather than repairing.

1. Separate the Top and Bottom Housing. (Follow steps 1 – 3 in Section 3.2.1.)
2. On the T71XW, remove the Main PCB. (Follow steps 4 – 8 in Section 3.2.1.)
3. Remove the four screws holding the Display PCB to the Top Housing.
4. Carefully lift out the Display PCB, to avoid stretching the fine plastic ribbon cable connected to the Membrane Switch.
5. Gently remove the two ribbon cables – one connected to the Membrane Switch, and the other to the Main PCB. Avoid bending the pins.
6. Connect the ribbon cables to the replacement Display PCB, and position the board over the screw holes. Insert the screws and tighten them.
7. Carefully re-position the Main PCB over its screw holes in the Top Cover. Re-insert and tighten the screws.
8. Reconnect the cables removed in Steps 4 and 5 of Section 3.2.1.
9. On the T71P, re-insert the hex screws connecting the RS232 Interface port to the Bottom Housing.
10. Close the Housing and re-insert the four screws.
11. Perform calibration procedures. (See Section 1.8.)
12. Perform testing procedures. (See Chapter 4.)

3.2.3 Membrane Switch Replacement

1. Separate the Top and Bottom Housing. (Follow steps 1 – 3 in Section 3.2.1.)

2. On the T71XW, when removing the old Membrane Switch, be sure to extract the plastic ribbon cable that connects to the PCB's Keypad Connector.

3. Remove the protective backing from the back of the new Membrane Switch; carefully position it on the Top Cover, starting at the bottom of the cover. Use a rolling motion to smooth the Membrane Switch into position.

4. Carefully re-position the Main PCB over its screw holes in the Top Cover. Re-insert and tighten the screws.

5. Reconnect the cables removed in Steps 4 and 5 of Section 3.2.1.

6. On the T71P, re-insert the hex screws connecting the RS232 Interface port to the Bottom Housing.

7. Close the Housing and re-insert the four screws.

8. Perform calibration procedures. (See Section 1.8.)

9. Perform testing procedures. (See Chapter 4.)

4.1 TESTING

Before and after servicing the Indicator, operational and performance tests should be made to determine if it meets specifications. Turn the Indicator ON and allow it to warm up for at least ten minutes before performing these checks. The masses used for calibration should be ASTM Class 4 or OIML Class F2 tolerance or better.

NOTE:
Make sure the test area is free from drafts and that the base rests on a level and vibration-free surface. The masses used for final calibration must be adjusted to ASTM Class 4 or OIML Class F2 tolerance or better.

4.2 Power Test

The purpose of this test is to determine if the electronic circuitry of the Indicator is functioning properly or not at all. In some cases, the AC Adapter or line cord supplied with the Indicator may have become defective.

1. Plug the AC Adapter or line cord into a suitable power source.

2. With the Indicator connected to an appropriate power supply, press the **ON/ZERO *Off*** button. The Indicator performs a self-test, indicates the software revision and then goes into weighing mode.

3. If all of the displays appear normal in this test, continue with the next test. If the display did not appear, check that the AC input is good, and that the AC adapter or line cord are functioning properly, and repeat the test. If the display was erratic, the PC board is defective and requires replacement.

4.3 Performance Tests Using a Scale Base

These tests are performed on the Indicator using a known good scale base and test mass. At this point, the Indicator has been checked for full display, menu setup and calibrated.

If a Load Cell Simulator is being used, proceed to paragraph 4.4.

Select the maximum possible resolution (<1:20,000) to obtain the most accurate test results.

4.3.1 Overload/Underload Test

This test determines if the Indicator displays the proper indication when an underload or overload condition exists on the scale base.

1. With the Indicator ON and no mass on the scale base, lift up on the scale base platform and observe the display. The display should indicate Error 8.2. Release the platform. The display should return to zero.

Note: Do not exceed Load Cell capacity when testing the Indicator.

2. Place a mass on the scale base platform which slightly exceeds the capacity of the scale base, and observe the Indicator display. The display should indicate Error 8.1. Remove the mass from the scale base. The display should return to zero.

4.4 Performance Tests Using a Load Cell Simulator

A simulator can be used in place of a scale base if available.

– Connect the simulator to Terminal Block J4 (the Load Cell terminal block) on the PCB, so that EX+, EX–, S+ and S– are matched at each end of the cable. (See Figures 1-1 and 1-2, page 1-4.)

– Set the Jumper connections, as explained in Section 1.6.1 and 1.6.2.

Test the Indicator as follows:

1. Set the simulator to zero. Power on the Indicator. Perform a Span Calibration, with zero at the simulator's zero setting, and 100% capacity at the simulator's 2.0 milli-volt setting.

2. Following calibration, check that the Indicator's display reading is stable at each simulator level, up to the maximum set in the calibration. If the readings are stable, the Indicator is functioning properly.

4.5 Calibration Retention Test

This test checks that the Indicator retains calibration after power is removed and then restored.

1. Turn the Indicator OFF and disconnect the AC Adapter or power cord.

2. Wait one minute, then reconnect the AC Adapter or power cord to the Indicator.

3. Check to insure that the Indicator retained calibration settings.

4.6 RS232 Interface Test / Print Test

The RS232 Interface performance can be monitored using an external printer or computer connected to the Indicator.

To set up communication parameters, see Section 1.9.1.

Once the communications parameters match between the Indicator and either a computer or printer, it is possible to test the Indicator's print function.

– Press the **Print/*Units*** button. Printing to an external printer or computer should occur each time the button is pressed.

This section of the manual contains exploded views for the 7000 Series T71 Indicators. The exploded view drawings are designed to identify the parts which can be serviced on the indicator in the field.

NOTE:

In all cases where a part is replaced, the balance must be thoroughly checked after the replacement is made. The balance **MUST** meet the parameters of all applicable specifications in this manual.

If further technical information is needed, please contact your local Ohaus distributor, or:

Ohaus Corporation, www.ohaus.com
19A Chapin Road
P.O. Box 2033
Pine Brook, NJ 07058-2033 USA

Tel: 973-377-9000
Fax: 973-593-0359

In the United States call toll free, 800-526-0659 between 8:00 a.m. and 6:00 p.m. EST.

5.1 7000 SERIES T71P INDICATOR: HOUSING & INTERNAL PARTS

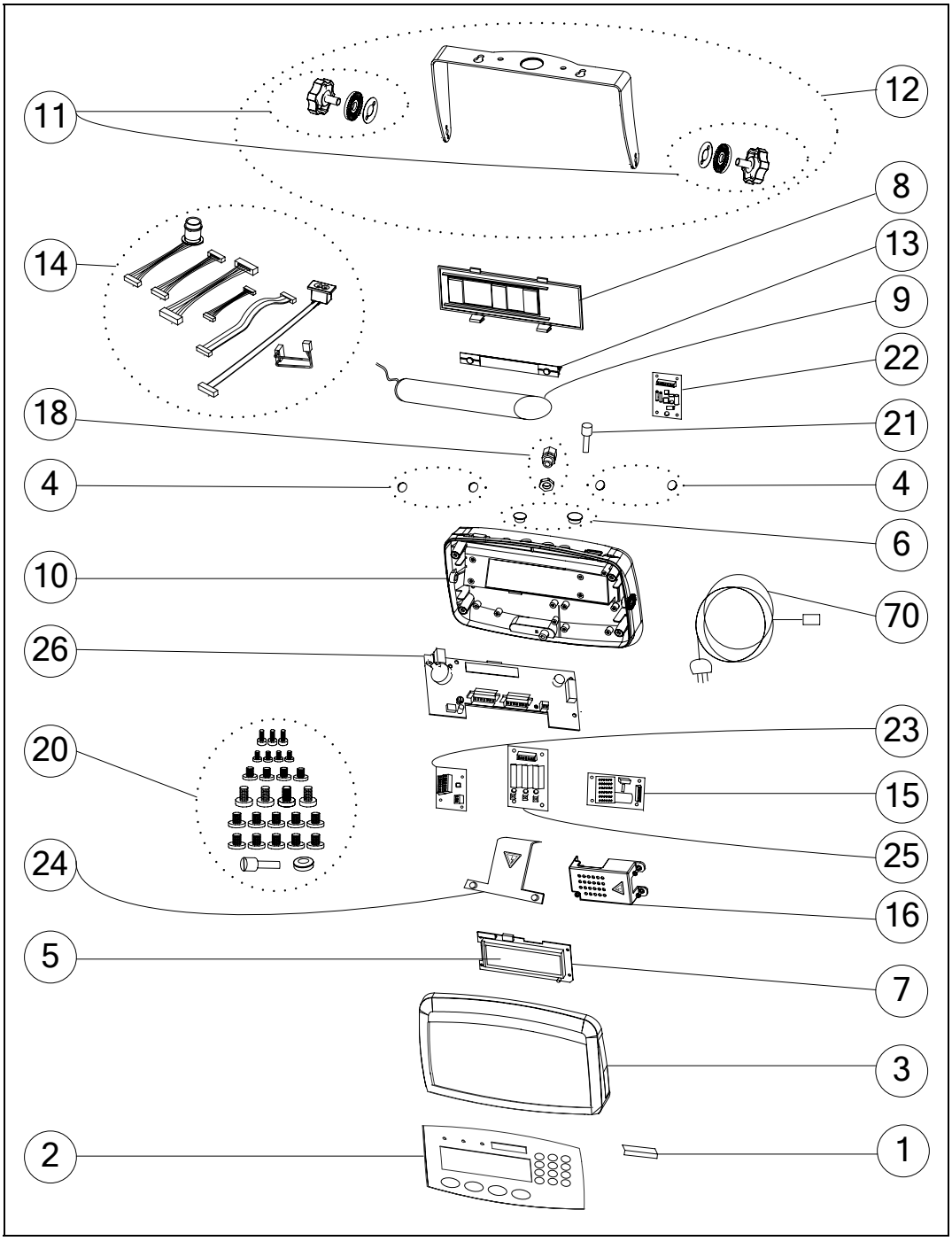


Figure 5-1. Series 7000 T71P Indicator: Housing & Internal Parts.

5.1 7000 SERIES T71P INDICATOR: HOUSING & INTERNAL PARTS

TABLE 5-1. T71P INDICATOR: HOUSING & INTERNAL PARTS

Drawing Item	Description
1	Capacity Label Kit
2	Membrane Switch
3	Front Housing
4	Feet, Set of 4,
5	Display LCD
6	Hole Plugs
7	Display PCB
8	Battery Cover
9	NiMH Battery
10	Rear Housing
11	Knob Kit (set of 2)
12	Wall Mount Kit
13	Battery Guide
14	Cable Kit
15	PCB, Power Supply
16	Power Supply PCB Cover
18	I/O Fitting
20	Hardware Kit
21	I/O Filler Plug
22	Recharge PCB
23	RS422/485 Interface Kit (Accessory)
23	RS232 Interface Kit (Accessory)
24	Relay PCB Cover
25	AC Relay Kit (Accessory)
26	Main PCB
70	Line Cord

5.2 7000 SERIES T71XW INDICATOR: HOUSING & INTERNAL PARTS

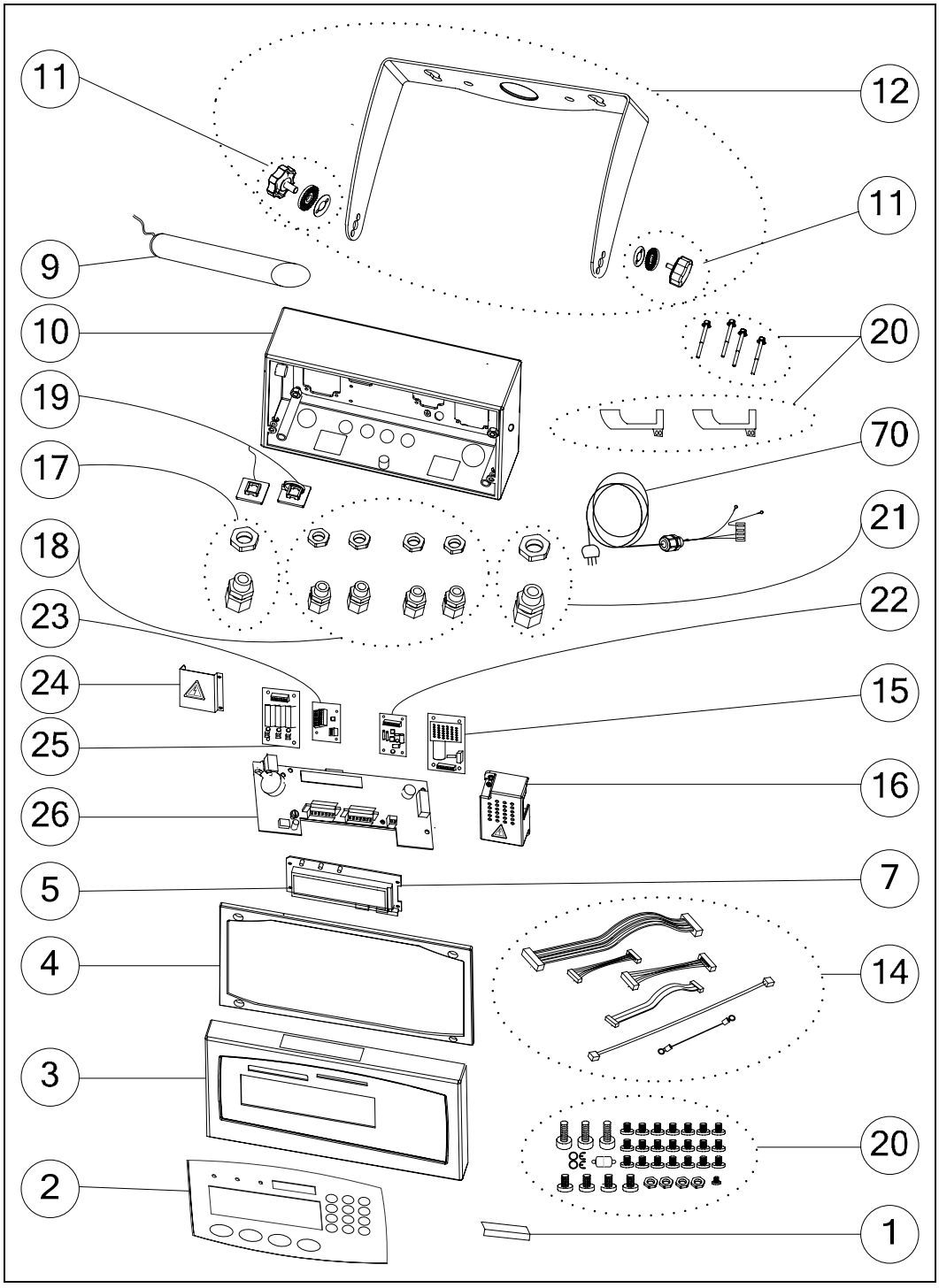


Figure 5-1. Series 7000 T71XW Indicator: Housing & Internal Parts.

5.1 7000 SERIES T71XW INDICATOR: HOUSING & INTERNAL PARTS

TABLE 5-1. T71XW INDICATOR: HOUSING & INTERNAL PARTS

Drawing Item	Description
1	Capacity Label Kit
2	Membrane Switch
3	Front Housing
4	Gasket
5	Display LCD
7	Display PCB
9	NiMH Battery
10	Rear Housing
11	Knob Kit (Set of 2)
12	Wall Mount Kit
14	Cable Kit
15	PCB, Power Supply
16	Cover, Power Supply PCB
17	I/O Fitting
18	I/O Fitting
19	Cable Mounts, Internal
20	Hardware Kit
21	I/O Fitting
22	Recharge PCB
23	Accessory, RS422/485 Interface Kit
23	Accessory, RS232 Interface Kit
24	Cover, Relay PCB
25	Accessory, AC Relay Kit
26	Main PCB
70	Line Cord

APPENDIX A. GEOGRAPHICAL ADJUSTMENT VALUES

TABLE A-1. GEOGRAPHICAL ADJUSTMENT VALUES.

Geographical latitude away from the equator (North or South), in degrees and minutes.	Elevation above sea level in meters										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Elevation above sea level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
0°00′ - 5°46′	5	4	4	3	3	2	2	1	1	0	0
5°46′ - 9°52′	5	5	4	4	3	3	2	2	1	1	0
9°52′ - 12°44′	6	5	5	4	4	3	3	2	2	1	1
12°44′ - 15°06	6	6	5	5	4	4	3	3	2	2	1
15°06′ - 17°10′	7	6	6	5	5	4	4	3	3	2	2
17°10′ - 19°02′	7	7	6	6	5	5	4	4	3	3	2
19°02′ - 20°45′	8	7	7	6	6	5	5	4	4	3	3
20°45′ - 22°22′	8	8	7	7	6	6	5	5	4	4	3
22°22′ - 23°54′	9	8	8	7	7	6	6	5	5	4	4
23°54′ - 25°21′	9	9	8	8	7	7	6	6	5	5	4
25°21′ - 26°45′	10	9	9	8	8	7	7	6	6	5	5
26°45′ - 28°06′	10	10	9	9	8	8	7	7	6	6	5
28°06′ - 29°25′	11	10	10	9	9	8	8	7	7	6	6
29°25′ - 30°41′	11	11	10	10	9	9	8	8	7	7	6
30°41′ - 31°56′	12	11	11	10	10	9	9	8	8	7	7
31°56′ - 33°09′	12	12	11	11	10	10	9	9	8	8	7
33°09′ - 34°21′	13	12	12	11	11	10	10	9	9	8	8
34°21′ - 35°31′	13	13	12	12	11	11	10	10	9	9	8
35°31′ - 36°41′	14	13	13	12	12	11	11	10	10	9	9
36°41′ - 37°50′	14	14	13	13	12	12	11	11	10	10	9
37°50′ - 38°58′	15	14	14	13	13	12	12	11	11	10	10
38°58′ - 40°05′	15	15	14	14	13	13	12	12	11	11	10
40°05′ - 41°12′	16	15	15	14	14	13	13	12	12	11	11
41°12′ - 42°19′	16	16	15	15	14	14	13	13	12	12	11
42°19′ - 43°26′	17	16	16	15	15	14	14	13	13	12	12
43°26′ - 44°32′	17	17	16	16	15	15	14	14	13	13	12
44°32′ - 45°38′	18	17	17	16	16	15	15	14	14	13	13
45°38′ - 46°45′	18	18	17	17	16	16	15	15	14	14	13
46°45′ - 47°51′	19	18	18	17	17	16	16	15	15	14	14
47°51′ - 48°58′	19	19	18	18	17	17	16	16	15	15	14
48°58′ - 50°06′	20	19	19	18	18	17	17	16	16	15	15
50°06′ - 51°13′	20	20	19	19	18	18	17	17	16	16	15
51°13′ - 52°22′	21	20	20	19	19	18	18	17	17	16	16
52°22′ - 53°31′	21	21	20	20	19	19	18	18	17	17	16
53°31′ - 54°41′	22	21	21	20	20	19	19	18	18	17	17
54°41′ - 55°52′	22	22	21	21	20	20	19	19	18	18	17

TABLE A-1. GEOGRAPHICAL ADJUSTMENT VALUES.

Geographical latitude away from the equator (North or South), in degrees and minutes.	Elevation above sea level in meters										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Elevation above sea level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
55°52′ - 57°04′	23	22	22	21	21	20	20	19	19	18	18
57°04′ - 58°17′	23	23	22	22	21	21	20	20	19	19	18
58°17′ - 59°32′	24	23	23	22	22	21	21	20	20	19	19
59°32′ - 60°49′	24	24	23	23	22	22	21	21	20	20	19
60°49′ - 62°09′	25	24	24	23	23	22	22	21	21	20	20
62°09′ - 63°30′	25	25	24	24	23	23	22	22	21	21	20
63°30′ - 64°55′	26	25	25	24	24	23	23	22	22	21	21
64°55′ - 66°24′	26	26	25	25	24	24	23	23	22	22	21
66°24′ - 67°57′	27	26	26	25	25	24	24	23	23	22	22
67°57′ - 69°35′	27	27	26	26	25	25	24	24	23	23	22
69°35′ - 71°21′	28	27	27	26	26	25	25	24	24	23	23
71°21′ - 73°16′	28	28	27	27	26	26	25	25	24	24	23
73°16′ - 75°24′	29	28	28	27	27	26	26	25	25	24	24
75°24′ - 77°52′	29	29	28	28	27	27	26	26	25	25	24
77°52′ - 80°56′	30	29	29	28	28	27	27	26	26	25	25
80°56′ - 85°45′	30	30	29	29	28	28	27	27	26	26	25
85°45′ - 90°00′	31	30	30	29	29	28	28	27	27	26	26

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Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176 - TestEquipmentDepot.com